OUTLINE OF MORPHOLOGICAL OBSERVATION ON THE DEVELOPMENT OF TETHY A SERICA LEBWOHL

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OUTLINE OF MORPHOLOGICAL OBSERVATION ON THE DEVELOPMENT OF *TETHYA SERICA* LEBWOHL

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INTRODUCTION

Tethya serica Lebwohl, a tetraxonian sponge lives on the shallow bottom of the sea near the Misaki Marine Biological Station. This sponge is dioecious and fertilization takes place ectosomatically. In other details the species shows some peculiarities in its developmental processes, which have been described by Nagai 1910 and Kume 1952 their results briefly will be summarized. 1) The unfertilized egg has numerous fine cytoplasmic processes radiating from its surface and when it is fertilized, the fertilization membrane is elevated and these proceses are taken into the perivitelline space (Fig. 1 a–e). 2) The surface of the fertilized egg becomes so sticky that the egg adheres to the substratum. 3) The segmentation of

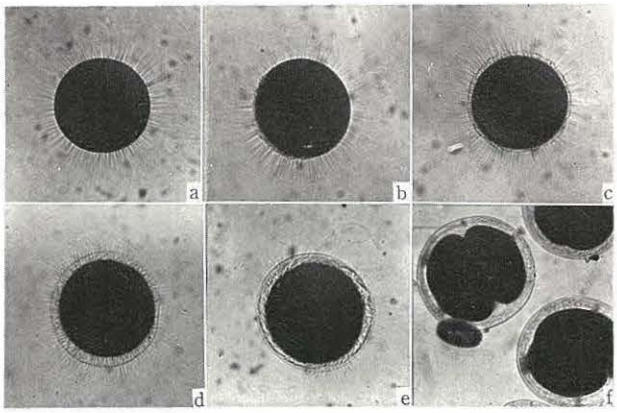

Fig. 1. a) Unfertilized egg; Protoplasmic processes radiating from its surface. b–e) Fertilized egg; The fertilization membrane elevates gradually and the processes are spirally twested in (e). f) First cleavage; Processes were completely taken into the perivitelline space, but they still remain as granules.

the egg is total and almost equal but there are many variations in the cleavage pattern, which are due to the adhesion of the egg to the substratum. The external changes of this sponge from segmentation to the young form have been described by Watanabe in 1957. This report will deal with the internal changes as observed in serial sections, in addition to the external changes.

The writer thanks the staff of the Misaki Marine Biological Station and Professor Matazo Kume for his continuous direction.

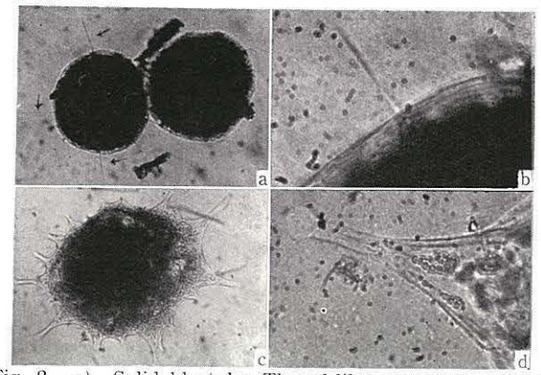

Fig. 2. a) Solid blastula; Thread-like processes extend from the surface. b) An outer cell now extending a thread-like process. c) Embryo extended on substratum by pulling of processes and becomes somewhat flattend. d) Cells move out into processes stretching them to form multicellular structures.

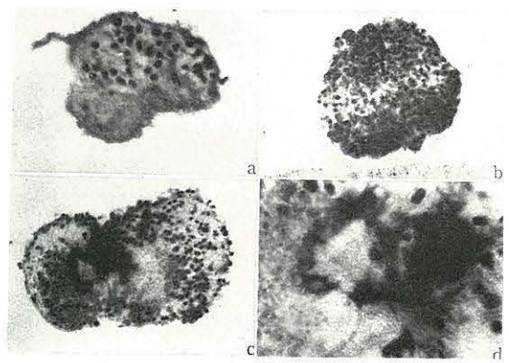

Fig. 3. a) Longitudinal section of invaginating stage; Fibrous structures differentiate in the depressed region. b) Embryo becomes spherical again and the root begins to form beneath embryo. Spicules differentiate in the center of embryo. c, d) Two embryos lying in contact with each other, they invaginate at contact plane. Fibrous structure are seen there.

OBSERVATIONS

1. *External and internal changes to the root-forming stage.* Following segmentation, the embryo becomes a solid blastula. In this stage, some of the outer cells of the blastula stretch threadlike processes (one from each cell) from the surface. These threads extend further and attach to the substratum to which the egg first adhered (Fig. 2 a, b). These cells then move out into the perivitelline space, extending pseudopodia as if they were being drawn by the processes. As a result,

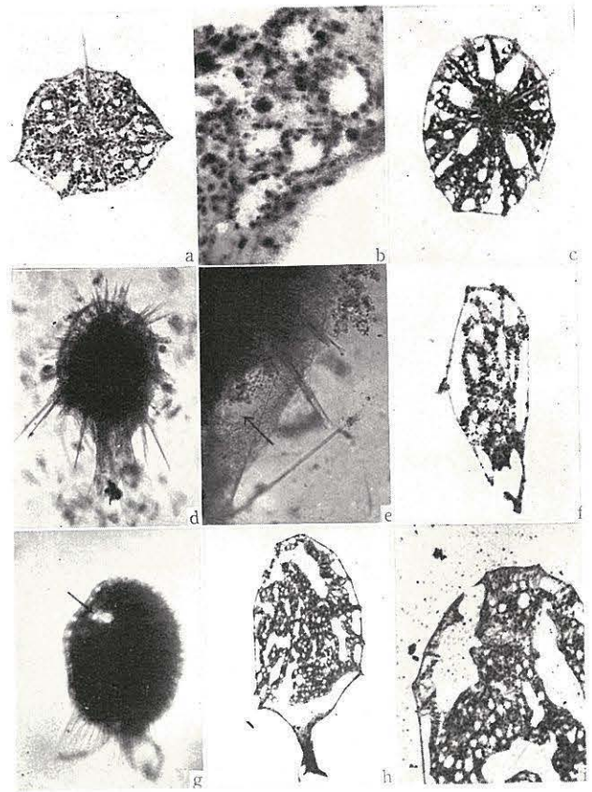

Fig. 4. a) Cross section of ten day embryo; Flagellated chambers and framework of megasclers formed. b) Flagellated chamber c) Cross section; Incurrent and excurrent cavities are formed between the megasclers. d) Fifteen day embryo; Incurrent cavities (transparent parts) differentiate between megasclers. e) Excurrent pore opens near base of root. f) Longitudinal section of 17 day embryo, through excurrent pore. g) A young sponge with osculum. (fixed specimen) h) Longitudinal section of young sponge. i) Same specimen as that in (h); longitudinal section through osculum.

these processes become wider and other cells enter them, forming multicellular structures (Fig. 2 c, d). As these multicellular processes radiate in various directions, the embryo as a whole becomes somewhat flattened and stretches on the substratum (Fig. 2 c). These processes later unite to form the root. Presently the solid blastula begins to invaginate on the attached side. The cells on this side move inside the embryo, resulting in a depreseion of the surface and fibrous structures differentiate in this region (Fig. 3 a, c, d). These fibers and the processes which constitute the rudiment of the root come together beneath the embryo and form the root. At this time the flattening disappears and the embryo becomes spherical again. (Fig. 3 b). During this time the scleroblasts are differentiated from cells at the center of embryo, and these form the spicules (Fig. 3 b).

2. *Radial arrangement of internal structure and formation of canal system.* Some of the invaginated cells differentiate into cells which form the flagellated chambers. These are surrounded by small flagellated cells, but the flagella of these cells are not clear with ordinary staining procedures. These flagellated chambers are found here and there inside the embryo (Fig. 4 a). Meanwhile, the spicules, which are being formed in the center of the embryo, grow and radiate in all directions and construct a radial framework of large spicules (megasclers) (Fig. 4 c, d). Cross section of this stage show that the incurrent canals are begining to develop between the megasclers. When the incurrent canals are completely formed, the epidermis is seen to spread voer the outer surface of the embryo, forming their dermal layer, which becomes pierced by a number of incurrent pores. Inside the embryo, excurrent canals also developed between the megasclers. Each flagellated chamber is connected with an incurrent canal by a prosodus, and with an excurrent canal by an aphodus. In such a way, the embryo allows a radical by symmetrical structure (Fig. 4 c, d). The excurrent pore opens at first near the base of the root (Fig. 4 e, f), but afterwards an osculum develops on the upper surface of the embryo (Fig. 4 g, i). Here the current streames out of the sponge. In such a manner, the embryo grows into young sponge (Fig. 4 g, h).

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